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526 Rec'd PCT/PTO 09 JUN 2000



FORM PTO-1999 (REV. 12-29-99)		U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE		ATTORNEY'S DOCKET NUMBER 1182-24	
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371					
INTERNATIONAL APPLICATION NO. PCT/GB98/03698		INTERNATIONAL FILING DATE 10 December 1998		PRIORITY DATE CLAIMED 10 December 1997	
TITLE OF INVENTION CONNECTION BETWEEN A WALL AND A PIPE					
APPLICANT(S) FOR DO/EO/US Wayne Wright, John Boudry					
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:					
1. <input checked="" type="checkbox"/> This is a FIRST submission of items concerning a filing under 35 U.S.C. 371. 2. <input type="checkbox"/> This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371. 3. <input type="checkbox"/> This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1). 4. <input checked="" type="checkbox"/> A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date. 5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2)) a. <input type="checkbox"/> is transmitted herewith (required only if not transmitted by the International Bureau). b. <input type="checkbox"/> has been transmitted by the International Bureau. c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US). 6. <input type="checkbox"/> A translation of the International Application into English (35 U.S.C. 371(c)(2)). 7. <input type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)) a. <input type="checkbox"/> are transmitted herewith (required only if not transmitted by the International Bureau). b. <input type="checkbox"/> have been transmitted by the International Bureau. c. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired. d. <input type="checkbox"/> have not been made and will not be made. 8. <input type="checkbox"/> A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)). 9. <input checked="" type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)). (unsigned) 10. <input type="checkbox"/> A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).					
Items 11. to 16. below concern document(s) or information included:					
11. <input checked="" type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98. 12. <input type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included. 13. <input checked="" type="checkbox"/> A FIRST preliminary amendment. <input type="checkbox"/> A SECOND or SUBSEQUENT preliminary amendment. 14. <input type="checkbox"/> A substitute specification. 15. <input type="checkbox"/> A change of power of attorney and/or address letter. 16. <input type="checkbox"/> Other items or information:					
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By: <u>Thomas M. Galgano, Esq.</u> Thomas M. Galgano, Esq.			Dated: <u>6/9/00</u>		

17. ☒ The following fees are submitted:**BASIC NATIONAL FEE** (37 CFR 1.492 (a) (1) - (5)) :Neither international preliminary examination fee (37 CFR 1.482)
nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO
and International Search Report not prepared by the EPO or JPO \$970.00International preliminary examination fee (37 CFR 1.482) not paid to
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and all claims satisfied provisions of PCT Article 33(1)-(4) \$96.00**ENTER APPROPRIATE BASIC FEE AMOUNT =****CALCULATIONS** PTO USE ONLY

\$ 840.00

Surcharge of \$130.00 for furnishing the oath or declaration later than ☐ 20 ☐ 30
months from the earliest claimed priority date (37 CFR 1.492(e)).

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE
Total claims	16 - 20 =	0	X \$18.00
Independent claims	2 - 3 =		X \$78.00
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ \$260.00

TOTAL OF ABOVE CALCULATIONS = \$ 840.00Reduction of 1/2 for filing by small entity, if applicable. A Small Entity Statement
must also be filed (Note 37 CFR 1.9, 1.27, 1.28).**SUBTOTAL = \$ 840.00**Processing fee of \$130.00 for furnishing the English translation later than ☐ 20 ☐ 30
months from the earliest claimed priority date (37 CFR 1.492(f)).**TOTAL NATIONAL FEE = \$ 840.00**Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be
accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property +**TOTAL FEES ENCLOSED = \$ 840.00**Amount to be
refunded: \$
charged: \$a. ☒ A check in the amount of \$ 840.00 to cover the above fees is enclosed.b. ☐ Please charge my Deposit Account No. _____ in the amount of \$ _____ to cover the above fees.
A duplicate copy of this sheet is enclosed.c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any
overpayment to Deposit Account No. 07-0130. A duplicate copy of this sheet is enclosed.**NOTE:** Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR
1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

SIGNATURE

Thomas M. Galgano

NAME

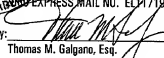
27,638

REGISTRATION NUMBER



09/581378
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By: 
Thomas M. Galgano, Esq.

Dated: June 9, 2000

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

DOCKET NO.: 1182-24

Applicant : Wayne Wright et al.
Serial No. : not yet assigned
Filed : simultaneously herewith
For : CONNECTION BETWEEN A WALL AND A PIPE

Assistant Commissioner of Patents
Washington, D.C. 20231

PRELIMINARY AMENDMENT

Dear Sir:

Preliminary to a first Office Action in the above case, please amend the application as follows:

IN THE CLAIMS

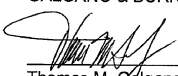
Please cancel Claims 1-21 and insert new claims 22-37 as per the attached sheets.

REMARKS

By this Preliminary Amendment, the original claims 1-21 have been cancelled and new claims 22-37 have been substituted in their place. The multiple dependency of certain of the claims have been eliminated so as to avoid the surcharge associated therewith. Accordingly, entry of the foregoing amendments is respectfully requested and an early and favorable action on the merits of the application is earnestly solicited.

Respectfully submitted,

GALGANO & BURKE


Thomas M. Galgano, (27,638)
GALGANO & BURKE

300 Rabro Drive - Suite 135
Hauppauge, NY 11788
Tel.: (631) 582-6161
Fax: (631) 582-6191
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Claims

22. A fitting for providing a substantially fluid-tight seal between an opening in a chamber wall and a pipe passing through said opening, said fitting comprising:-

- 5 (i) a tubular sleeve adapted to pass through the opening in the chamber wall and further adapted to allow the pipe to pass through the sleeve;
- (ii) a flange, extending radially outwardly from the sleeve, a first surface of the flange being configured to contact the chamber wall around substantially the whole circumference of the opening;
- 10 (iii) an energy transfer means situated at or near the first surface of the flange, said energy transfer means being adapted to heat the first surface of the flange in order to form a substantially fluid tight seal;
- characterised in that the tubular sleeve extends from both sides of the flange such that, in use, the fitting can be positioned on the inside or outside of the chamber
- 15 wall.

23. A fitting according to Claim 22, in which the first surface comprises a fusible material which, when heated via the energy transfer means, at least partially melts, causing the fitting and the wall to be fused together.

24. A fitting according to Claim 22 in which the energy transfer means comprises

20 conduction means for conducting an electric current, said conduction means in use, being heated by the current, to cause said heating of the first surface.

25. A fitting according to Claim 22, in which the fitting is adapted for use with a wall which is of a material which is not suitable for being attached to the fitting by electrofusion, the first surface of the fitting incorporating an adhesive of a type which

25 is activated by heat, wherein the heating of the first surface by the energy transfer means activates the adhesive and thereby bonds the fitting to the wall.

26. A fitting according to Claim 25, in which the adhesive is selected from a thermoplastic, thermoset, cross-linking or pressure sensitive adhesive.
27. A fitting according to Claim 24, in which the conduction means comprises a heating wire which is embedded within the first surface.
- 5 28. A fitting according to Claim 22, in which the sleeve is of a substantially circular cross-section, and the flange is radial.
29. A fitting according to Claim 24, in which the fitting includes terminals for connecting the conduction means to a current supply.
30. A fitting according to Claim 22 wherein the fitting further comprises a sealing member or boot adapted to form a fluid tight seal between the sleeve and the pipe.
- 10 31. A fitting and sealing member according to Claim 30, in which the sealing member is resilient, and there is provided clamping means for clamping the sealing member to the pipe and/or the sleeve.
32. A method of forming a seal between an opening in a chamber wall and a pipe passing through said opening, the method comprising the steps of:-
- 15 (a) applying a fitting to the pipe, said fitting comprising:-
- (i) a tubular sleeve adapted to pass through the opening in the chamber wall and further adapted to allow the pipe to pass through the sleeve;
- 20 (ii) a flange, extending radially outwardly from the sleeve, a first surface of the flange being configured to contact the chamber wall around substantially the whole circumference of the opening;
- (iii) an energy transfer means situated at or near the first surface
- 25 of the flange, said energy transfer means being adapted to heat the first surface of the flange in order to form a substantially fluid tight seal;

characterised in that the tubular sleeve extends from both sides of the flange such that, in use, the fitting can be positioned on the inside or outside of the chamber wall;

(b) applying energy to the energy transfer means and thereby heating
5 the first surface and, optionally, the portion of the wall of the chamber in the vicinity of the flange to cause the fitting to be come fused or bonded to the chamber wall in a fluid tight manner;

(c) applying a sealing member or boot to form a fluid tight seal between the sleeve and the pipe.

10 33. A method according to Claim 32, in which said heating is achieved by passing an electric current through conduction means located at or near the first surface of the flange.

34. A method according to Claim 32, in which the materials constituting the wall and the surface are such that the surfaces are fused together by a process of
15 electrofusion.

35. A method according to Claim 32, in which the method also includes providing an adhesive which is activated by said heating to cause the fitting to be bonded to the wall.

36. A method according to Claim 32 in which an adhesive is incorporated into
20 the first surface on the flange.

37. A method according to Claim 32, in which the wall comprises a manhole chamber wall for a subterranean fuel tank.



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

DOCKET NO.: 1182-24

APPLICANT OR PATENTEE : WRIGHT ET AL.
 SERIAL or PATENT NO. :
 FILED or ISSUED :
 TITLE : CONNECTION BETWEEN A WALL AND PIPE

SMALL ENTITY DECLARATION

☐ FOR INDEPENDENT INVENTOR(S)

As a below-named inventor, I hereby declare that I am an independent inventor who (1) has not assigned, granted, conveyed, or licensed, and (2) is under no obligation under contract or law, to assign, grant, convey, or license, any rights in the invention, to any person who could not likewise be classified as an independent inventor if that person had made the invention, or to any concern which would not qualify as a small business concern or a nonprofit organization, as defined in 37 CFR 1.9.

☒ FOR SMALL BUSINESS CONCERN

I hereby declare that **PETRO TECHNIK LIMITED** is a business concern which qualifies as a small business concern as defined in §1.9(d) - namely, (1) whose number of employees, including those of its affiliates, does not exceed 500 persons; and (2) which has not assigned, granted, conveyed, or licensed, and is under no obligation under contract or law to assign, grant, convey, or license, any rights in the invention to any person who could not be classified as an independent inventor if that person had made the invention, or to any concern which would not qualify as a small business concern or a nonprofit organization under this section; and that the exclusive rights to the invention have been conveyed to and remain with the above-identified small business concern.

I further declare that all statements made herein of my own knowledge are true and all statements made on information and belief are believed to be true; and further, that these statements were made with the knowledge that willful, false statements and the like, so made, are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful, false statements may jeopardize the validity of the patent application or any patent issuing thereon.

Each of the undersigned hereby grants the firm of **GALGANO & BURKE, U.S. Federal Courthouse Building, 300 Rabro Drive, Hauppauge, New York 11788, U.S.A.**, the power to insert in this Small Entity Declaration any further identification which may be necessary or desirable to comply with the rules of the U.S. Patent and Trademark Office for filing and acceptance of this Declaration.

INVENTOR(S)

SMALL BUSINESS CONCERN:

PETRO TECHNIK LIMITED

Name:

By

Date:

Name

Title:

Date :

Field of the invention

This invention relates to fittings for providing a seal between a wall and a pipe passing through an opening in the wall, to a method of providing such a seal, and to an assembly comprising the combination of a pipe, a wall and a fitting providing a seal between the two. The invention is particularly applicable to the provision of a seal between a pipe and a wall of a manhole chamber as found in a subterranean fuel tank or sump for a dispensing pump, for example in a petroleum forecourt installation.

10

Background to the invention

In petroleum forecourt installations, pipework running between dispensing pumps and a subterranean fuel storage tank passes into a manhole chamber which is situated directly above the manhole lid of the tank. The chamber is normally defined by an upstanding wall which, when viewed from above, can be of an octagonal, square or rectangular shape, and which includes apertures through which respective pipes pass.

It is desirable to provide a seal between each of the apertures and its respective pipe to avoid ingress of water into the manhole chamber. To that end, it is known to attach a fitting to a portion of the wall around the aperture and a rubber "boot" that sleeves over the pipe and is clamped to both the pipe and the fitting by, for example, jubilee (TM) clips. Some types of fitting are bolted to the chamber wall, whilst other types of fitting provide inner and outer parts between which the wall is sandwiched, the inner and outer parts being held together by a screw-threaded connector which extends through the aperture. These connectors often incorporate a rubber seal located between a part of the connector and the chamber wall.

An example of a prior art seal is described in US5,538,035. This illustrates a flanged fitting for a subterranean tank. The flanged fitting is attached to the side of the tank by ultrasonic welding or a chemical bonding agent. Whilst heat sealing is referred to as a method of attachment, if heating is used then it must be applied using an external source of heat.

Heat sealable connections are known per se. For example US5,601,315 describes a plastic moulded connector for connecting a plastic branch pipe onto a plastic pipeline, comprising a saddle portion and a pipe socket portion. Both the saddle and pipe portions contain electric heating windings. However, the configuration of this coupling makes it entirely unsuitable for the present application.

Neither type of fitting provides a completely effective seal.

Consequently, both types of seal can allow water to leak into the manhole chamber and to accumulate in a pool in the bottom of the chamber. This in turn makes the maintenance of the chamber bottom and tank entrance extremely difficult.

Furthermore, it has been found that the removal and replacement of the rubber seals of conventional arrangements can also be extremely difficult and expensive.

It is an object of the present invention to provide a fitting which overcomes some or all of the above disadvantages.

Summary of the Invention

According to a first aspect of the present invention, there is provided a fitting for providing a substantially fluid-tight seal between an opening in a chamber wall and a pipe passing through said opening, said fitting comprising:-

- (i) a tubular sleeve adapted to pass through the opening in the chamber wall and further adapted to allow the pipe to pass through the sleeve;
- (ii) a flange, extending radially outwardly from the sleeve, a first surface
- 5 of the flange being configured to contact the chamber wall around substantially the whole circumference of the opening;

characterised in that the flange incorporates an energy transfer means at or near the first surface, said energy transfer means enabling the first surface and/or the wall of the chamber in the vicinity of the flange to be heated to cause the flange and the

10 wall to fuse or bond together in order to form a substantially fluid tight seal.

It is believed that water which leaks through conventional fittings and seals does not pass between the sealing member, for example the rubber gasket seal, and the pipe, but instead passes between the fitting and the wall. By contrast, the present invention provides a fitting which, when installed, is sealed to the wall

15 around the aperture, and which does not require attachment to the wall by any invasive method, for example bolts, which would require further apertures in the wall. Thus, a seal formed using a fitting in accordance with the present invention should be substantially watertight or at least far more effective than the seals provided by conventional fittings.

20 Preferably, the first surface comprises a fusible material, such as a thermoplastic (for example polyethylene) which, when heated via the energy transfer means, at least partially melts, causing the fitting and the wall to be fused together.

Preferably, the energy transfer means comprises conduction means for conducting an electric current, said conduction means in use, being heated by the

25 current, to cause said heating of the surface.

The process by which two components are fused together as a result of electrical heating from a conductor (situated at or near the interface between the two components prior to fusing) is known as electrofusion. Electrofusion is normally used to provide seals at the join between two lengths of pipe, (particularly
5 polyethylene pipe) in a pipeline. The same process can be used by a fitting in accordance with the present invention if the wall to which the fitting is to be fused is of a suitable thermoplastic material, such as polyethylene.

It is however possible for the fitting to be required for a wall which is of a material, for example fibreglass, which is not suitable for being attached to the fitting
10 by electrofusion. In this case, therefore, the first surface of the fitting preferably comprises an adhesive which is of a type which is activated by heat, wherein the heating of the surface by the energy transfer means activates the adhesive and thereby bonds the fitting to the wall. The adhesive can be a thermoplastic, thermoset, cross-linking or pressure sensitive adhesive of a type known per se.

15 This type of fitting can be attached to a wall by a procedure similar to that used by the fitting which is bonded to a wall by electrofusion.

Preferably, the conduction means comprises a heating wire which is conveniently embedded within the surface. The surface may to advantage be part of a flange which extends from the sleeve. Where the sleeve is of a substantially
20 circularly symmetric cross-section, the flange is preferably radial.

If the energy transfer means comprises conduction means, the fitting preferably includes terminals, for connecting the conduction means to a current supply, which are accessible from the opposite side of the flange from the surface.

According to a second aspect of the invention, there is provided a fitting in
25 accordance with the first aspect of the invention and a sealing member for sealing

the sleeve of the fitting to a pipe passing therethrough. The sealing member may be incorporated into the sleeve, or may be formed as an initially separate fitting which is subsequently attached to the sleeve after the fitting has been installed.

Preferably, the sealing member is resilient, and there is provided clamping
5 means (such as jubilee clips) for clamping the sealing member to the pipe and/or the sleeve. Conveniently, the sealing member comprises a rubber sleeve.

According to a third aspect of the invention, there is provided a method of providing a seal between a pipe and a wall having an opening through which the pipe passes, the method comprising the steps of applying a fitting to the pipe, the
10 fitting having a sleeve through which the pipe passes and a surface which is placed against a portion of the wall around the opening so as to surround the latter; heating the surface and/or said portion of the wall thereby to cause the wall and the surface, and hence the fitting to become fused or bonded together, and sealing the sleeve to the pipe before, during or after said heating step.

Preferably, said heating is achieved by passing an electric current through
15 conduction means in the vicinity of the portion of the wall and the surface. The conduction means may be provided on the wall, but is preferably carried by the surface of the fitting.

Conveniently, the materials constituting the wall and the surface are such
20 that the surfaces are fused together by a process of electrofusion.

Where other materials are used, however, the method also includes providing an adhesive which is activated by said energy transfer to cause the fitting to be bonded to the wall. The adhesive may form the surface of the fitting. Additionally or alternatively, the adhesive may be provided on the wall of the
25 chamber.

Preferably, the wall comprises a manhole chamber wall for a subterranean fuel tank.

The invention also lies in a manhole chamber for a subterranean fuel tank, a pipe which passes through an aperture in the wall of the chamber, a fitting having a sleeve through which the pipe passes, the fitting being placed against the wall so as to surround the aperture, energy transfer means for heating the fitting and/or the chamber to cause the fitting and/or chamber to be fused or bonded together in a region which surrounds the aperture, and a sealing member for sealing the pipe to the sleeve.

Brief Description of the Drawings

10 The invention will now be described, by way of example only, with reference to the accompanying drawings in which:

Figure 1 is a partially cut-away side view of part of a petroleum forecourt installation which includes a tank having a manhole chamber, having a fitting in accordance with the invention;

15 Figure 2 is a cut-away side elevation, to an enlarged scale, showing the fitting in position on the manhole chamber wall;

Figure 3 is a front elevational view of the fitting (prior to installation); and

Figures 4 and 5 are sectional side views of two further embodiments of fittings in accordance with the invention, each drawing showing the fitting when installed;

20 Figures 6, 7, 8 and 9 show sectional side views and end elevations of further embodiments;

Figures 10, 11, 12 and 13 show sectional side views of various fittings showing tolerances for pipes not aligned perpendicular to the chamber wall;

Figure 12 shows a typical and elevation for such fittings;

25 Figures 13, 14 and 15 show fittings according to the present invention in use with conventional pipe electrofusion seals;

Figures 16 to 22 show various other configurations of fittings;

Figures 23 and 24 show perspective views of a preferred embodiment;

Definitions

- 5 In this context the following terms have the meanings given below in addition to their ordinary dictionary meanings:-

chamber – any receptacle designed to keep a fluid in or out. This includes, but is not limited to manhole and sump chambers as described herein. It also includes tanks in general.

- 10 energy transfer means – a generic term describing any form of energy source. Typically it takes the form of a resistance winding which heats up when an electrical current is passed through it. The term also encompasses other welding techniques including ultrasonic welding and induction welding.

- flange – any collar suitable for attaching a fitting to a chamber wall. In the examples
15 given the surface of the flange which contacts the chamber wall is substantially planar. However, it will be understood that the flange must conform to the profile of the chamber wall around the pipe inlet opening. Thus the flange can adopt any suitable conformation to achieve the necessary contact with a flat or curved surface or even the corner of a container wall.

- 20 fluid – whilst the examples provided relate mainly to liquids, the term fluid refers to liquids, vapours and gases. For example, should a leak occur in a secondarily contained pipe in a garage forecourt installation then petrol or petrol vapour will collect in the manhole chamber. It is essential that this petrol vapour cannot escape through the wall of the chamber and into the surrounding ground.

- 25 pipe – the examples given herein are for a generally circular cross-sectioned single wall pipe. However, the invention also covers other cross-sections such as box

sections, corrugated and the like and secondarily contained pipes of the "pipe-within-a-pipe" type. In this case the sealing member or boot for sealing the sleeve to the pipe will be rather more complex. However, such boots are well known in the art.

5 The invention also encompasses pipes which are not circular in cross-section.

tubular sleeve - this term has a very broad meaning. It includes any projection from the flange which substantially encircles a pipe passing through the fitting and which enables a seal to be made between the fitting and the pipe. The flange and sleeve need not be of unitary construction and the two-part threaded construction shown in Figure 4 offers certain advantages.

Description of the Preferred Embodiments

15 The present embodiments represent currently the best ways known to the applicant of putting the invention into practice. But they are not the only ways in which this can be achieved. They are illustrated, and they will now be described, by way of example only.

20 The petroleum forecourt installation shown in Figure 1 comprises a pair of dispensing pumps 1 and 2 connected to a subterranean tank 3 through a pipeline 4. The pipeline 4 is formed from contiguously arranged sections of polyethylene pipe. The pipeline 4 extends from the pumps 1 and 2 into a manhole chamber 6 immediately above the tank 3. The chamber 6 is defined by a polyethylene member 8 having a side wall 10 and a base 12.

25 Figure 1 shows two lines extending from the pipeline 4 into the tank 3. These lines relate to two alternative forms of fuel supply system and are both shown for the sake of completeness. In practice, only one of the lines would extend from

the pipeline 4 into the manhole chamber 6. One of those lines is a suction line 14 which is used where the dispensing pumps and 2 are fitted with suction pumps. The alternative line, reference 16, is a pressure line connected to the pipeline 4 via a pump 18 which is operable to propel fuel from the tank 3 to the pumps 1 and 2.

5 It can be seen from Figure 1 that the wall 10 has to be apertured in order to allow the pipeline 4 to pass into the chamber 6. In order to prevent water leaking from the surrounding ground (here denoted by reference numeral 20) into the chamber 6 through the aperture, the pipe is sealed to the cylindrical wall 10 by means of a fitting 22 shown in more detail in Figures 2 to 5.

10 The fitting comprises a cylindrical sleeve 22 having an outwardly projecting radial flange 24 towards one end. The flange and sleeve define a central passage through which the pipe of the pipeline 4 extends. It can also be seen from Figure 2 that the sleeve extends through the aperture in the wall 10 so that the sleeve is at least partially accommodated within the chamber 6, whilst the flange 24 is situated
15 outside the chamber.

The flange 24 has a surface 26 which is flat, to enable the surface to be placed against the wall 10 as shown in Figure 2. Accordingly, the flange 24 makes contact with the wall 10 in a region which surrounds the opening through which the pipe 4 passes. A wire 28 is embedded in the surface 26 in a generally spiral shape
20 as shown in Figure 3, and the ends of the wire 28 are connected to electric terminals 30 and 32.

The sleeve 22 is also adapted to receive a rubber boot 34 which is clamped at one end over the sleeve by a jubilee clip 36. The opposite end of the boot 34 is clamped onto the pipe of the pipeline 4 by a jubilee clip 38.

25 When the fitting (constituted by the sleeve 22 and flange 24) is installed, the flange 24 is initially pressed against the wall 10 and the terminals 30 and 32

connected to a source of electric current. The current passes through the wire 28, causing the latter to heat the adjacent surface of the flange 24 (and part of the tank 10), to cause the flange 24 and wall 10 to fuse together in a disc-shaped region which surrounds the opening in the tank 10. This not only retains the fitting on the
5 wall 10 but also provides a seal which encircles the opening in the tank, and thus prevents water passing between the flange and the wall 10 through the opening of the latter into the chamber 6. The passage of any water which travels along the surface of the part of the pipe outside the chamber 6 will be blocked by the boot seal 34.

10 If the chamber wall were to be made of fibreglass, a modified version of fitting would be used. The modified version is identical to the version shown in Figures 2 and 3, apart from the inclusion of a layer of adhesive over the surface of the flange which would constitute the surface 26 on the flange 24 and which overlies the heating wire. The adhesive is a thermoplastic or cross-linking adhesive which
15 once heated, forms a bond between the flange 24 and the wall 10. Again, since the bond will surround the opening in the wall 10, it also acts as a liquid tight seal to prevent the ingress of water.

It will be appreciated that various modifications to the fitting and/or chamber wall are possible within the scope of the invention. Thus, for example, the wire 28
20 could be embedded in the chamber wall 10, and the latter could carry the adhesive coating instead of, or in addition to, the fitting 24.

Figures 4 and 5 show alternative forms of fitting when installed on the chamber wall 10.

The fitting shown in Figure 4 has an outer circular back plate 40 which is
25 formed as a radial flange on a sleeve 42, and which carries a spiral winding of a wire 44 connectable to an electric current source by means of terminals 46 and 48.

The flange 40 and sleeve 42 are formed of a thermoplastics material which can be fused to the (thermoplastic) wall 10 in a similar fashion to the fitting shown in Figure 2.

Alternatively, either the flange 40 or wall 10 can carry a heat-activated
5 adhesive if the wall 10 is of a material not suitable for electrofusion welding.

The outer surface of the sleeve 42 carries a screw-threaded portion which enables the sleeve, and hence the flange, to be screwed onto an outer sleeve 50 from which a further radial flange 52 projects. The inner flange 52 is pressed against the inside of the wall 10, and includes a circular groove which
10 accommodates an O-ring seal 54 for preventing the ingress of any water which manages to breach the seal between the flange 40 and outside of the wall 10.

The sleeve 50 carries a rubber boot 56, clamped to the sleeve by a jubilee clip 58. The boot is also clamped to the pipe of the pipeline 4 by a jubilee clip 60, and serves a similar purpose to that of the boot 34.

As the outside of the fitting (i.e. flange 40 and sleeve 42) is securely
15 bonded/fused to the wall 10, the removal of the sleeve 50 (and flange 52) for repair or maintenance can be readily done without the need to have any access to the exterior of the wall 10.

Figure 5 shows the same fitting when modified to accept a pipeline which
20 uses secondary containment (in which fuel is conveyed along an inner fuel supply pipe 62 which extends through an outer, secondary pipe 64). It can be seen that the only modification to the fitting is to the boot seal, and associated jubilee clips which are now arranged to provide a seal between the fitting and both the pipes 64 and 62 (three jubilee clips 60, 60' and 58 are used to that end). It can be seen that the boot
25 56 is also configured to accommodate part of a leak detection sensor for detecting any leaks of fuel from the inner pipe 62 into the interstitial space between the pipes 62 and 64.

A similar arrangement of fittings to those shown in Figures 2, 4 or 5 are used to seal the pipeline 4 to each of a pair of sumps 68 and 70 (which are rectangular in plan) beneath the pumps 1 and 2 respectively. A respective fitting is installed on the sumps 68 and 70 about each aperture (in the sumps) through which the pipeline 4 passes.

Figures 6, 7, 8 and 9 shown embodiments of the present invention which are adapted to allow a degree of misalignment of the pipe as it enters through the chamber wall. The inside surface of the sleeve 72 is chamfered out towards the outer surfaces of the fitting. That is to say, the internal diameter of the sleeve is smallest at its central point, or thereabouts, and the inner diameter of the sleeve increases as one traverses the longitudinal axis of the fitting, in either direction. In practice, it is as if the fitting was constructed from two shallow frustoconical portions welded together, narrower point to narrower point. The substantially narrowest point is at 74.

The flexibility of this arrangement is shown in figures 10, 11 and 12. In these cases provision for a 10° misalignment either side of perpendicular is provided for. However, by careful design this angle can be increased as desires.

Enlargements in Figures 6 and 8 show how provision can be made to secure a rubber boot in place over the inner part of the sleeves 76 and 86 which extend into the chamber. A protrusion or enlarged lip 80, 90 extends around the external circumference of the sleeve. This enables a rubber boot to be clamped securely around the sleeve as required.

Important features of the invention are shown in Figures 10, 11 and 12. These illustrate how it is possible to extend the sleeve from both sides of the chamber wall for maximum flexibility and also to allow for attachment of the fitting inside as well as outside the chamber. These designs share many common

features. Referring to Figure 10, this illustrates a sleeve 92 which extends in use both inside and outside the chamber wall. The chamber wall is not shown in this Figure but would locate generally at 94 and but up to the flange 96.

The surface of flange 96 has embedded into it a heating element 98. The shape and dimensions of the sleeve can be adjusted such that it only extends into the chamber. This is shown as Option 1 in Figure 11. Alternatively, a degree of symmetry about the flange can be provided such that the boot can be welded either on the inside or the outside of the chamber wall. This is shown in Option 2 of Figure 11. In this case a substantially similar portion of sleeve 102, 104 suitable for attachment to a rubber boot, extends on either side of the flange.

It is also possible to adapt these fixings for use with conventional electrofusion pipe welding sockets. An example of this is illustrated in Figure 11 Option 3. In this case a portion of the sleeve 106 extends outwards from the chamber wall in use to act as a termination for a secondary containment pipe. A suitable termination is a Wavi Duo PN4 socket from PetroTechnik Ltd.

The fitting of Option 3 will allow for some misalignment of the pipe. However, when secondary containment is used there should be no misalignment of the primary pipe.

This is just one way of terminating any secondary containment system. It is equally possible to use the types of termination shown in Figures 13, 14 and 15 which illustrate different arrangements for different pipe diameters. Pipe jointing components 108 to 124 inclusive, of a type known per se, can be used to couple and/or terminate secondary pipes. This greatly increases the flexibility of this type of fitting.

Perspective views of a fitting according to the present invention are shown in Figures 23 and 24. These illustrate a flange 130 extending radially outwardly from a

sleeve 132. The sleeve extends on both sides of the flange. A raised rim 134 extends around the outer circumference of each end of the sleeve. Electrical terminals 136 and 138 allow current to be connected to a heating wire embedded in the surface of the flange adapted to engage with the chamber wall.

- 5 Fittings according to the present invention can be formed from any suitable material as selected by the materials specialist. Preferably the fittings are formed from a thermoplastic material such as polyethylene. In a particularly preferred embodiment they are formed as a single unit by turning or casting.

- 10 Methods of laying a wire into a flat surface are known, for example by Rutland Plastics Ltd, and can be applied here without substantial modification.

 The present invention also encompasses a method of fixing a pipe to a chamber wall as described above and the combination of apparatus that results from operating said method.

- 15

Claims

1. A fitting for providing a substantially fluid-tight seal between an opening in a chamber wall and a pipe passing through said opening, said fitting comprising:-
- 5 (i) a tubular sleeve adapted to pass through the opening in the chamber wall and further adapted to allow the pipe to pass through the sleeve;
- (ii) a flange, extending radially outwardly from the sleeve, a first surface of the flange being configured to contact the chamber wall around substantially the whole circumference of the opening;
- 10 characterised in that the flange incorporates an energy transfer means at or near the first surface, said energy transfer means enabling the first surface and/or the wall of the chamber in the vicinity of the flange to be heated to cause the flange and the wall to fuse or bond together in order to form a substantially fluid tight seal.
2. A fitting according to Claim 1, in which the first surface comprises a fusible
- 15 material which, when heated via the energy transfer means, at least partially melts, causing the fitting and the wall to be fused together.
3. A fitting according to either Claim 1 or claim 2, in which the energy transfer means comprises conduction means for conducting an electric current, said conduction means in use, being heated by the current, to cause said heating of the
- 20 surface.
4. A fitting according to Claim 1 or Claim 3, in which the fitting is adapted for use with a wall which is of a material which is not suitable for being attached to the fitting by electrofusion, the first surface of the fitting incorporating an adhesive of a type which is activated by heat, wherein the heating of the surface by the energy
- 25 transfer means activates the adhesive and thereby bonds the fitting to the wall.

5. A fitting according to Claim 4, in which the adhesive is selected from a thermoplastic, thermoset, cross-linking or pressure sensitive adhesive.
6. A fitting according to any of Claims 3 to 5 inclusive, in which the conduction means comprises a heating wire which is embedded within the first surface.
7. A fitting according to any preceding claim, in which the sleeve is of a substantially circular cross-section, and the flange is radial.
8. A fitting according to Claim 3 or Claim 6, in which the fitting includes terminals for connecting the conduction means to a current supply.
9. A fitting according to any preceding claim wherein the fitting further
10. comprises a sealing member or boot adapted to form a fluid tight seal between the sleeve and the pipe.
10. A fitting and sealing member according to Claim 9, in which the sealing member is resilient, and there is provided clamping means for clamping the sealing member to the pipe and/or the sleeve.
15. 11. A fitting according to any preceding claim modified in that the energy transfer means is incorporated into the wall of chamber in the region directly beneath the flange.
12. A method of forming a seal between an opening in a chamber wall and a pipe passing through said opening, the method comprising the steps of:-
- 20 (a) applying a fitting to the pipe, said fitting comprising a tubular sleeve adapted to pass through the opening in the chamber wall and further adapted to allow the pipe to pass through the sleeve; a flange, extending radially outwardly from the sleeve, a first surface of the flange being configured to contact substantially the whole
- 25 circumference of the flange, the flange incorporating an energy transfer means at or near the first surface;

- (b) applying energy to the energy transfer means and thereby heating the first surface and/or the portion of the wall of the chamber in the vicinity of the flange to cause the fitting to become fused or bonded to the chamber wall in a fluid tight manner;
- 5 (c) applying a sealing member or boot to form a fluid tight seal between the sleeve and the pipe.
13. A method according to Claim 12, in which said heating is achieved by passing an electric current through conduction means in the vicinity of the portion of the wall and the first surface.
- 10 14. A method according to Claim 13, in which conduction is carried by the first surface.
15. A method according to either Claim 13 or Claim 14, in which the materials constituting the wall and the surface are such that the surfaces are fused together by a process of electrofusion.
- 15 16. A method according to Claim 13 or claim 14, in which the method also includes providing an adhesive on the first surface which is activated by said heating to cause the fitting to be bonded to the wall.
17. A method according to Claim 16, in which the adhesive is incorporated into the first surface on the flange.
- 20 18. A method according to any of Claims 13 to 17, in which the wall comprises a manhole chamber wall for a subterranean fuel tank.
19. An assembly comprising a combination of a manhole chamber for a subterranean fuel tank, a pipe which passes through an aperture in the wall of the chamber, a fitting having a sleeve through which the pipe passes, the fitting being
- 25 placed against the wall so as to surround the aperture, energy transfer means for heating the fitting and/or the chamber to cause the fitting and/or chamber wall to be

fused or bonded together in a region which surrounds the aperture, and a sealing member for sealing the pipe to the sleeve.

20. A fitting substantially as described herein with reference to, and as illustrated in, any combination of the accompanying drawings numbers 2 to inclusive.

- 5 21. A method substantially as described herein with reference to any combination of the accompanying drawings.

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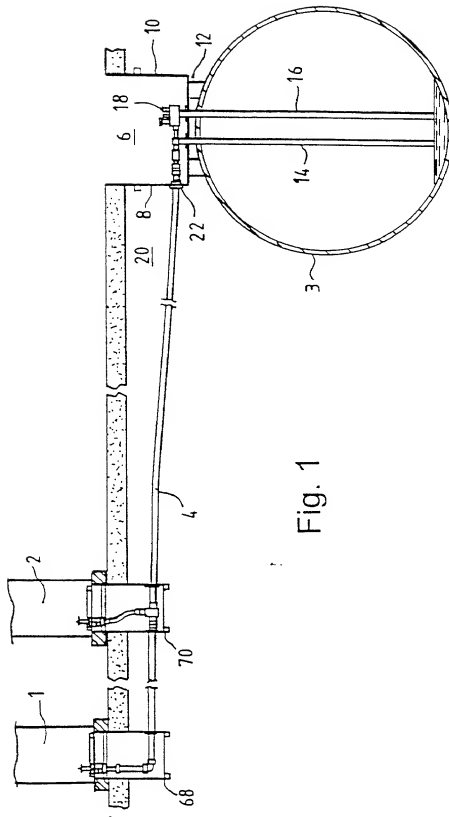
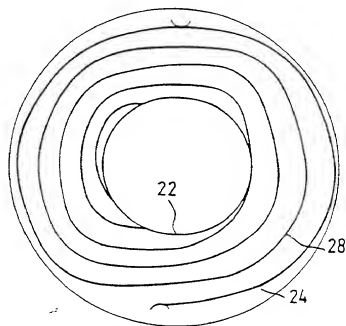
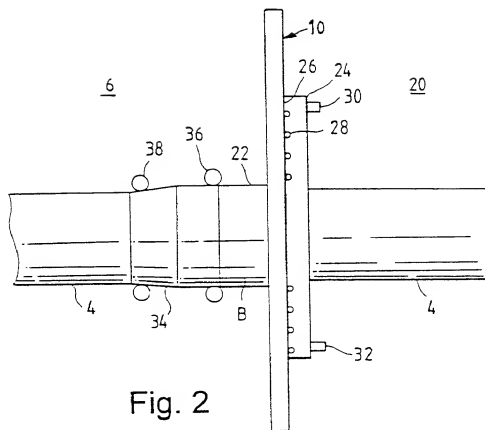


Fig. 1

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3/9

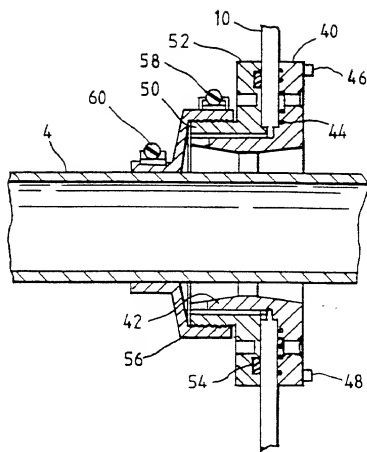


Fig. 4

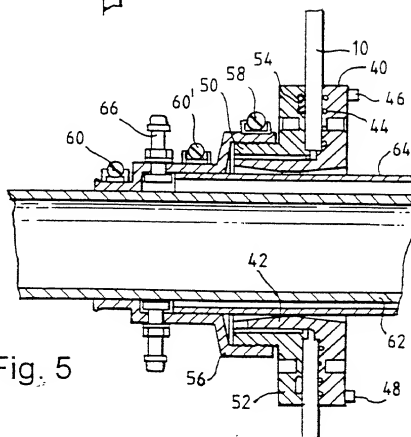


Fig. 5

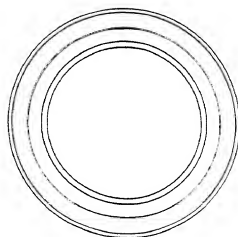
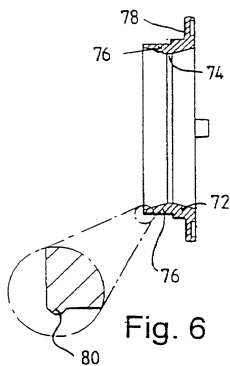


Fig. 7

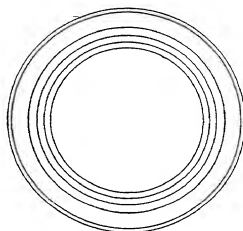
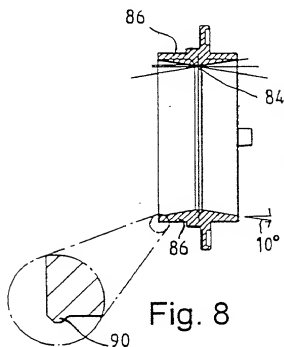


Fig. 9

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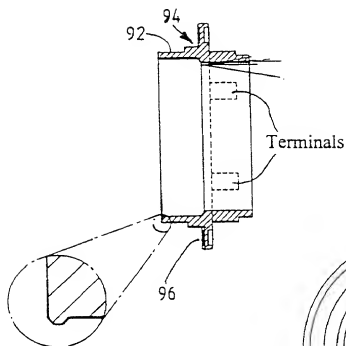


Fig. 10

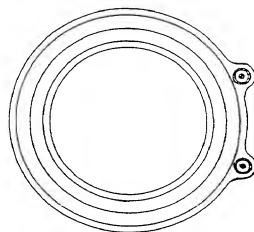
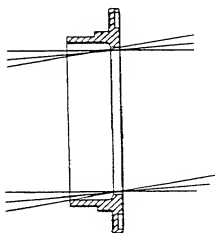
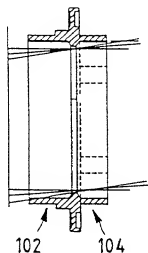


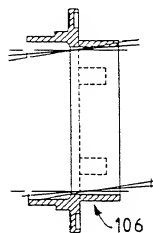
Fig. 12



Option 1
Weld on outside
of chamber



Option 2
Weld on either side
of chamber



Option 3
Electro - Fusion
Socket on outside

Fig. 11

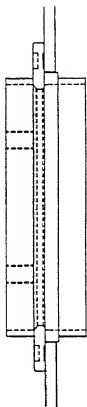


Fig. 20

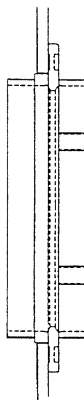


Fig. 21

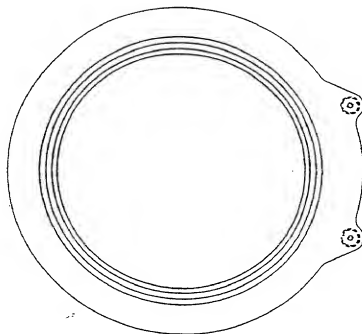


Fig. 22

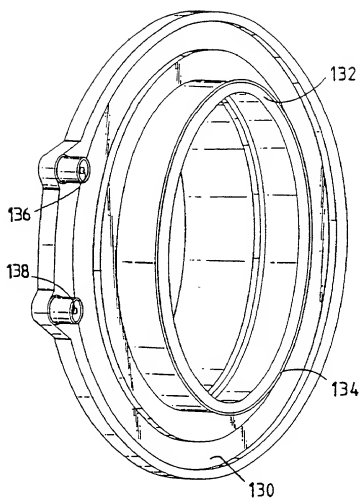


Fig. 23

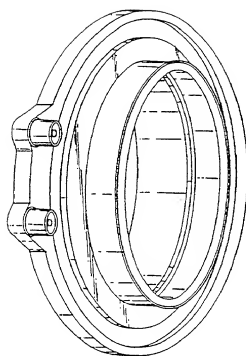


Fig. 24

COMBINED DECLARATION FOR PATENT APPLICATION AND POWER OF ATTORNEY
(Includes Reference to PCT International Applications)

ATTORNEY'S DOCKET NUMBER

1182-24



As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled: CONNECTION BETWEEN A WALL AND A PIPE
the specification of which (check only one item below):

- ☐ is attached hereto.
☐ was filed as United States application
Serial No. _____
on _____
and was amended _____ (if applicable).
☒ was filed as PCT international application
Number PCT/GB98/03698
on DECEMBER 10, 1998
and was amended under PCT Article 19 _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability of this application as defined in Title 37, Code of Federal Regulations, §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed:

PRIOR FOREIGN/PCT APPLICATION(S) AND ANY PRIORITY CLAIMS UNDER 35 U.S.C. 119:

COUNTRY (if PCT, indicate "PCT")	APPLICATION NUMBER	DATE OF FILING (day, month, year)	PRIORITY CLAIMED UNDER 35 USC 119
GREAT BRITAIN	9726154.9	DECEMBER 10, 1997	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
			<input type="checkbox"/> YES <input type="checkbox"/> NO
			<input type="checkbox"/> YES <input type="checkbox"/> NO

COMBINED DECLARATION FOR PATENT APPLICATION AND POWER OF ATTORNEY
(Includes Reference to PCT International Application)

ATTORNEY'S DOCKET NUMBER
1182-24

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) or PCT international application(s) designating the United States of America that is/are listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in that/those prior application(s) in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56 which became available between the filing date of the prior application(s) and the national or PCT international filing date of this application:

PRIOR U.S. APPLICATIONS OR PCT INTERNATIONAL APPLICATIONS DESIGNATING THE U.S. FOR BENEFIT UNDER 35 U.S.C. 120:

U.S. APPLICATIONS			STATUS (Check One)		
U.S. APPLICATION NUMBER	U.S. FILING DATE		PATENTED	PENDING	ABANDONED
PCT APPLICATIONS DESIGNATING THE U.S.					
PCT APPLICATION NO.	PCT FILING DATE	U.S. SERIAL NUMBERS ASSIGNED (if any)			

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. (List name and registration numbers):

THOMAS M. GALGANO, Registration No. 27,638
DANIEL P. BURKE, Registration No. 30,735

Send Correspondence to: Thomas M. Galgano, Esq., Galgano & Burke
300 Rabro Drive, Suite 135, Hauppauge, New York 11788

Direct Telephone Calls to:
(name and telephone number)
(631) 582-6161

2	FULL NAME OF INVENTOR	FAMILY NAME	FIRST GIVEN NAME	SECOND GIVEN NAME
		WRIGHT	WAYNE	CLIFTON AUGUSTUS
0	RESIDENCE & CITIZENSHIP	CITY	STATE OR FOREIGN COUNTRY	COUNTRY OF CITIZENSHIP
		LINTON MAIDSTONE KENT	UNITED KINGDOM	UNITED KINGDOM
1	POST OFFICE ADDRESS	POST OFFICE ADDRESS	CITY	STATE & ZIP CODE/COUNTRY
		29 CORNWALLIS AVENUE	LINTON MAIDSTONE KENT	ME17 4BW/U.K.
2	FULL NAME OF INVENTOR	FAMILY NAME	FIRST GIVEN NAME	SECOND GIVEN NAME
		BOUDRY	JOHN	ALEXANDRE
0	RESIDENCE & CITIZENSHIP	CITY	STATE OR FOREIGN COUNTRY	COUNTRY OF CITIZENSHIP
		BRETENHAM SUFFOLK	UNITED KINGDOM	UNITED KINGDOM
2	POST OFFICE ADDRESS	POST OFFICE ADDRESS	CITY	STATE & ZIP CODE/COUNTRY
		POPLAR FARM BUXHALL ROAD	BRETENHAM SUFFOLK	IP7 7PA/U.K.
2	FULL NAME OF INVENTOR	FAMILY NAME	FIRST GIVEN NAME	SECOND GIVEN NAME
0	RESIDENCE & CITIZENSHIP	CITY	STATE OR FOREIGN COUNTRY	COUNTRY OF CITIZENSHIP
3	POST OFFICE ADDRESS	POST OFFICE ADDRESS	CITY	STATE & ZIP CODE/COUNTRY

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

SIGNATURE OF INVENTOR 201

SIGNATURE OF INVENTOR 202

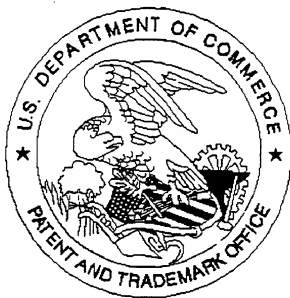
SIGNATURE OF INVENTOR 203

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There are 9 sheets of drawings enclosed

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